The Crustal Structure of the Eastern Marmara Region Using Receiver Function Analysis

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This study focuses on the crust of the Eastern Marmara in order to understand how much the structure is influenced by the tectonic history and also by the activity of the NAF. Recent studies have claimed that the crustal thickness varies significantly on the north and south of the NAF, which is assumed to indicate the separation line between Eurasian and Anatolian Plates. The present study aims to reevaluate the claim above, using newly available data and recently developed tools. The methods used during the study are the receiver function analysis and surface wave analysis. The first one is more intensively applied, since the second one only serves to introduce stability constraint in the inversions. Data are obtained from the permanent network of KOERI and from PIRES arrays. The main result of the study indicates that the receiver functions for the stations close to the fault zone are essentially very different from the rest and should be treated separately. They show signs of complex 3D structures of which two were successfully analyzed by forward modeling (HRTX and ADVT). A dipping shallow layer is seen to satisfy the major part of the azimuthal variation at these two stations. For the stations off the fault on the other hand, the receiver functions show a more stable behavior and are analyzed successfully by classical methods. CCP stacking, H-k estimation, single and joint inversion with surface waves, are used for that purpose. The results obtained from these totally independent approaches are remarkably consistent with each other. It is observed that the crustal thickness does not vary significantly neither in the NS, nor in the SW direction. A deeper Moho can only be expected on two most NE stations where a gradual transition is more likely than a sharp boundary (SILT and KLYT). The structural trends, although not significant, are generally aligned in the EW direction. In particular, a slower lower crust is observed in the southern stations, which is possibly linked to the mantle upwelling and thermal transient of the Aegean extension. Otherwise neither the velocity, nor the thickness of the crust does not imply any significant variation across the fault zone, as was previously claimed.